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U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy

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The BAMF Super Energy Savings Performance Contract (ESPC) can help Federal agencies develop and finance projects to take advantage of local, renewable resources to cut energy costs and meet Federal goals for increasing the government's use of renewable energy.

Biomass and Alternative Methane Fuel Super ESPCs Helping Federal Facilities Turn Waste into Energy

DOE's National Energy Technology Laboratory, in collaboration with DOE's Pacific Northwest National Laboratory and the Environmental Protection Agency (EPA), has developed the Biomass and Alternative Methane Fuels (BAMF) resource assessment and database for FEMP. With the BAMF resource assessment, the project team has matched more than 1,000 large Federal facilities with more than 3,500 sources of renewable biomass and alternative methane fuels located nearby. The proximity of these resources make them likely candidates for economically replacing conventional fuels at the identified facilities.

The BAMF Super Energy Savings Performance Contract (ESPC) can help Federal agencies develop and finance projects to take advantage of local, renewable resources to cut energy costs and meet Federal goals for increasing the government's use of renewable energy. The assessment has focused on three resources that are expected to be major contributors to Federal BAMF projects—wood waste, landfills, and wastewater treatment plants. Continuing studies will include cost analyses and surveys of additional BAMF resources.

Biomass from Wood Wastes and Residues

Biomass resources include any organic matter that is available on a renewable basis, including dedicated energy crops and trees; agricultural crops, wastes, and residues; wood wastes and residues; and aquatic plants, animal wastes, municipal wastes, and other waste materials. Currently biomass waste and residues, rather than virgin biomass, offer the most compelling energy cost savings compared to conventional fuels, because waste products often cost little or nothing, except for transportation, and may even have a negative cost if avoided landfill tipping fees are considered. Waste-to-energy projects can also prevent the destructive environmental effects that agriculture and municipal wastes can have on streams and aquifers.

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Under the Magnifying Glass

Agricultural residues, such as wheat straw and rice straw, offer a renewable source of energy for the Biomass and Alternative Methane Fuels Super Energy Savings Performance Contract. (See article on cover page.)

The Director's Column

In this issue, we examine alternative financing arrangements and services. FEMP is helping Federal agencies partner with the private sector to implement facility and energy improvements, streamline contracts, and maximize purchasing power. Energy savings performance contracts and utility energy service contracts are practical and flexible tools for accomplishing Federal water and energy efficiency improvements. These contracts, authorized by Congress, are designed to access private sector financing to pay for energy-efficiency improvements that save energy and money.

As you read this issue, please know that FEMP is ready to assist you with a wide variety of alternative financing services to help you implement your projects including:

- help to determine which contracting mechanism best fits your needs;
- training for agency acquisition teams;
- education and advisory support to agency staff on legal, technical, financial, and contractual issues;
- user-friendly guidance documents;
- help developing requests for proposals, initial proposals, and task or delivery orders;
- review of price and technical proposals; and
- experienced project facilitators to guide you through the entire process of developing and implementing a project.

To get started, call your DOE Regional Office's new FEMP Alternative Financing Representative (the list of DOE Regional Offices is available on the contacts page of the *FEMP Focus*). We look forward to working with you to develop best-value projects that are technically excellent, contractually and legally sound, and financially smart.

— Beth Shearer, Director
Federal Energy Management Program

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Fox Army Health Center Keeps Military Fit While Monitoring Utility Bills

The Fox Army Health Center is a 127,000-square-foot facility located in the U.S. Army's Redstone Arsenal near Huntsville, Alabama. The Health Center provides general medical and outpatient surgical care to active duty and retired military personnel and their families. Through a delivery order under DOE's Southeast Region Super Energy Savings Performance Contract (ESPC) with Johnson Controls, Inc., Fox Army Health Center is procuring new equipment through self-generated savings. The facility is also meeting goals to provide more accurate meter readings.

During World War II, the facility produced weapons and developed guided missile munitions. In the 1950s, the arsenal produced chemical ammunition. Today, Redstone Arsenal is the home of the U.S. Army Aviation and Missile Command, NASA's Marshall Space Flight Center, and the Health Center.

Upgrades That Save

While the Fox Army Health Center provides the latest in health care, it had fallen behind in energy efficiency. In September 2000, the facility entered into an ESPC contract that will improve operational and maintenance efficiency with minimal expense. "The problem-solving approach and ongoing flexibility made it easy for our team to achieve success," said James Staulcup, MEDCOM Southeast Regional Command Assistant Chief of Staff for Facilities.

Fox Army Health Center will save \$3.2 million in energy costs during the next 18 years by replacing two chillers and a cooling tower, installing a building automation system, retrofitting lighting, and installing submeters to track energy consumption costs and for utility billing. The project will also save 1.3 million kilowatthours of electricity and 23,651 therms of natural gas.

Through a cooperative agreement with the Southeastern Regional Medical Command and the Redstone Arsenal Department of Public Works, the Health Center will also benefit from significant savings through utility bill rate renegotiations. The project also met the U.S. Army Medical Command's goals and objectives to have tenants reimburse the Department of Public Works based upon actual meter readings instead of paying set costs per square foot. "Improved



Fox Army Health Center provides the latest in health care, while meeting the challenges of providing facility equipment updates and generating energy savings.

metering along with better utility prices means we're able to better manage our facility. That's good for us and for taxpayers," says Kathalene Roberts, Fox Army Health Center facilities manager.

Meeting Challenges

The weather presented a significant challenge for the contractor. The outdated chiller needed to be replaced within 7 months, before the next cooling season. Johnson Controls was able to design, order, receive, install, and commission the new chilled water system within that time frame.

In addition, Johnson Controls performed chemical treatment and asbestos abatement services on the facility's cooling towers and their support services include full-coverage maintenance and repair services for the installed chillers and cooling towers and their associated condenser water pumps. These services, along with a utility bill comparison measurement and verification plan, mean that Fox Army Health Center can concentrate on health care, rather than energy management, in the years to come.

For more information, please contact Kathalene Roberts of Fox Army Military Center at 256-955-6277 or kathalene.n.roberts@se.amedd.army.mil, or Tatiana Strajnic of FEMP at 202-586-9230 or tatiana.strajnic@ee.doe.gov.

Biomass and Alternative Methane Fuels are Widely Adaptable Energy Sources

If there is a reliable source of biomass near your facility, chances are good that you can use it to lower your energy bills and improve your energy security. Biomass, including waste products, can be processed and delivered to energy applications in the form of either a solid fuel or a gas. The biomass fuel is then converted into energy utilities in the form of electricity, heat, hot water, and steam.

Biomass can be processed and used directly to fire boilers, or can be converted, using biomass gasification technologies, into a synthesis gas consisting of hydrogen, carbon monoxide, and methane. Additionally, the microbial conversion of organic materials in wastewater treatment plants and landfills produces a biogas with high concentrations of methane. Wastewater treatment plants using anaerobic digesters produce a gas consisting of 50 to 75 percent methane and 20 to 50 percent carbon dioxide, along with trace levels of other gases. Landfills produce a gas consisting of 45 to 60 percent methane and 40 to 60 percent carbon dioxide, along with small amounts of other gases.

Only minor modifications are required to use these alternative methane fuels in equipment that normally uses natural gas. Treatments to remove moisture and impurities—including activated charcoal to absorb hydrogen sulfide and halogens (fluorine, chlorine, and bromine)—make these fuels suitable as a substitute for natural gas in boilers, engines, gas turbines, micro-turbines, and fuel cells. Since the methane content of landfill gas or digester gas is approximately one half of that contained in natural gas, twice the flow is required to supply the equivalent energy content. To accommodate this difference in flow, the valve orifices for fuel control must be enlarged. It is also sometimes necessary to have natural gas as a back-up fuel to ensure fuel consistency and flame stability.

Many energy technologies are being developed or adapted for biomass and alternative methane fuels. For example, DOE is currently sponsoring demonstration projects for fluid bed gasification and Biomass Gasification Combined Cycle (BGCC) electricity generation using wood waste. Combined-cycle systems combust the synthesis gas in a gas turbine and recover part of the exhaust heat for a steam cycle.



Wastewater treatment digester gas can yield methane fuel.

The tremendous variety of biomass fuels and the wide range of potential energy applications mean that these renewable resources represent a green energy opportunity for many Federal facilities.

For more information on how your facility can use biomass and alternative methane fuels to meet its energy requirements, please contact your FEMP Regional Office Representative (see list of DOE Regional Offices on contacts page of FEMP Focus). For additional information, please contact Christopher Abbuehl, National Program Representative for the BAMF Super ESPC, at 215-656-6995 or christopher_abbuehl@ee.doe.gov; Steve Cooke, BAMF Technical Lead, at 304-285-5437 or steve.cooke@netl.doe.gov; or Danette Delmastro, FEMP BAMF Team Lead, at 202-586-7632 or danette.delmastro@ee.doe.gov.

BIOMASS AND ALTERNATIVE METHANE FUEL SUPER ESPCS HELPING FEDERAL FACILITIES TURN WASTE INTO ENERGY (continued from page 1)

Huge quantities of wood residues from manufacturing, construction, demolition, and used containers are wasted in landfills and could be used for fuel instead. Wood can be used in many of the same energy applications as coal and has the environmental advantages of producing lower emissions and less ash, and contributing less to global warming than coal.

The BAMF assessment identified 813 large Federal facilities and 2,296 raw wood processors that are within 50 miles of each other—close enough to keep transportation costs reasonably low.

Landfill Gas

Landfills produce biogas as organic wastes decompose. This gas consists of approximately one-half methane (the primary component of natural gas), approximately one-half carbon dioxide, and a small amount of non-methane organic compounds. Instead of flaring landfill gas or allowing it to escape into the air, it can be captured, converted, and used as an energy source. Capturing and using landfill gas also prevents methane from migrating into the atmosphere, thus reducing associated odors and contributions to air pollution and global climate change.

Using data from EPA's Landfill Methane Outreach Program, the BAMF resource assessment identified 667 large Federal

facilities that have at least one landfill (without an already active landfill gas project) located within 15 miles of 508 unique landfills—within proximity to keep costs for piping landfill gas low enough to make its use economical.

Wastewater Treatment Plants

The anaerobic processes of decomposition that produce biogas can either occur naturally, as in a landfill, or in a controlled environment, such as a biogas plant. Wastewater treatment plant digester systems are airtight containers that maintain optimum conditions for quick decomposition of waste materials. Depending on the composition of the feedstock and system design, digester biogas is typically 50 to 75 percent methane; state-of-the-art systems can produce biogas composed of up to 95 percent methane. Wastewater treatment plants also produce sludge which can be a fuel resource.

Using data obtained from EPA's Water Discharge Permit database, the BAMF resource assessment identified 768 large Federal facilities with at least one wastewater treatment plant located within 15 miles of 1,638 unique wastewater treatment plants.

With the BAMF resource assessment, Federal agencies have a valuable tool to help identify candidate sites for biomass and alternative methane fuel projects. The proximity of BAMF resources to numerous Federal sites enables agencies to tap into the energy- and cost-saving benefits of these renewable resources.

Is there a BAMF Opportunity in Your Backyard? For more information about implementing waste-to-energy projects using the BAMF Super ESPC, please contact your FEMP Regional Office Representative (see list of DOE Regional Offices on contacts page of FEMP Focus). For additional information, please contact Christopher Abbuehl, National Program Representative for the BAMF Super ESPC, at 215-656-6995 or christopher_abbuehl@ee.doe.gov; Steve Cooke, BAMF Technical Lead, at 304-285-5437 or steve.cooke@netl.doe.gov; or Danette Delmastro, FEMP BAMF Team Lead, at 202-586-7632 or danette.delmastro@ee.doe.gov. Also see FEMP's web site at www.eren.doe.gov/femp/financing/espc/biomass.html.



Alternative methane fuels are being captured from many landfill sites today.



FEMP Examines Market Assessment of CHP Projects

Combined heat and power (CHP) installations are gaining attention as a technology that can improve the quality, reliability, and security of power systems at Federal facilities while also helping to meet Federal energy efficiency goals. FEMP's market assessment indicates that CHP (also known as cooling, heating, and power; or cogeneration) systems could be successfully applied in 9 percent of large Federal facilities, in projects that would have an average simple payback of 7 years. These installations could annually conserve 50 trillion Btu, reduce carbon dioxide emissions by 2.7 million metric tons, and save the Federal government \$170 million per year in energy costs.

Federal agencies have just begun to tap the potential of CHP systems, but more Federal energy managers are learning the benefits of these systems. Through "ADD CHP"—Accelerated Development and Deployment of CHP—at Federal sites, FEMP is responding to numerous requests for assistance and information from agencies interested in CHP. Also Federal agencies have begun to finance CHP projects through energy savings performance contracts, utility energy service contracts, or other financing vehicles.

More than 50 Federal sites already have CHP systems, and another 50 sites are pursuing projects that would install 100 megawatts of additional CHP capacity. Through the ADD CHP Program, FEMP can help Federal agencies connect with private-sector partners and financiers. Working with

Federal facilities interested in CHP, FEMP takes basic data provided by the facility and produces a summary report that helps managers understand factors affecting their site's CHP economics and decide whether to pursue CHP. Facilities with potential can assemble more site-specific data to support a higher level of CHP analysis. The screening report gives managers expected CHP performance and economics that can help justify next steps from other partners and financial assistance to pursue CHP projects. As of June 2002, more than 80 Federal sites had requested FEMP's CHP screening, and more than one half of these merited further study of their CHP potential.

For more information about technical support for CHP projects, please see the following FEMP web sites:

- *CHP Screening* – www.eren.doe.gov/femp/techassist/der_resources.html#technical.
- *Financing Options* – www.eren.doe.gov/femp/financealt.html.
- *DER Technology* – www.eren.doe.gov/femp/techassist/der_resources.html.

For additional information, please contact Shawn Herrera, FEMP DER Program, at 202-586-1511 or Shawn.Herrera@ee.doe.gov; Keith Kline, ADD CHP Team Lead, at 865-574-4230 or klinekl@ornl.gov; or Tatiana Strajnic, FEMP Project Financing Team Lead, at 202-586-9230 or tatiana.strajnic@ee.doe.gov.

FEMP's CHP Screening Service Now Easier

Seeking technical assistance through FEMP's Accelerated Development and Deployment of Combined Heat and Power (ADD CHP) screening service is now easier with FEMP's new web-based data entry form. The new simplified data entry page, which replaces the previous three-page form, requires minimal input from Federal facility managers. ADD CHP staff use the

data provided to complete the initial CHP screening, which helps facility managers determine if more detailed analysis is needed.

FEMP's screening assesses the potential economic viability of CHP systems at Federal installations using site-provided information about power and fuel consumption and cost. Since initiating

the ADD CHP Program in August 2001, FEMP has provided nearly 100 Federal sites with screening analyses. As shown in the figure (see page 7), approximately one third of sites assessed, representing 130 megawatts of electric power capacity, showed strong CHP potential

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FEMP'S CHP SCREENING SERVICE NOW EASIER

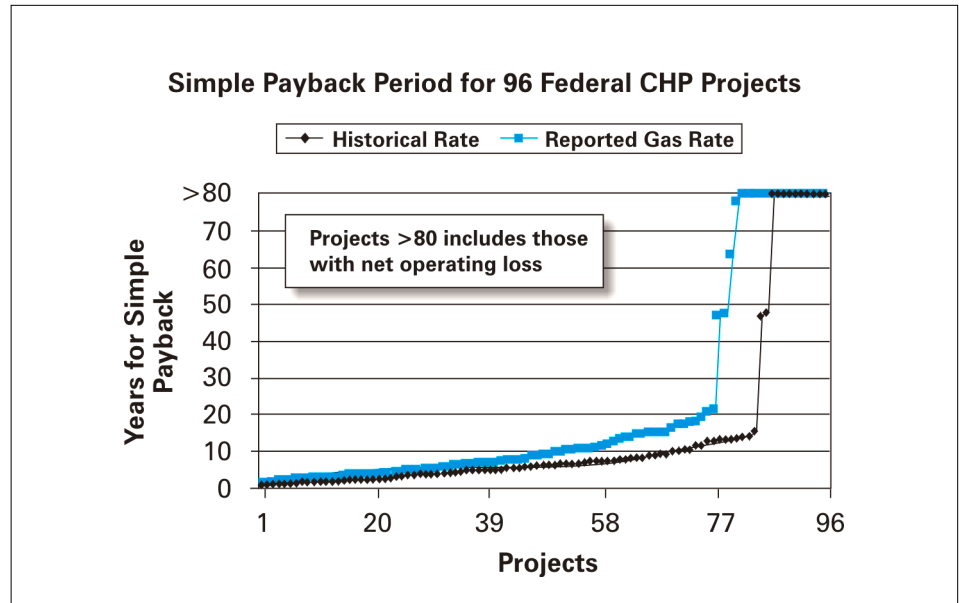
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meriting further action toward project development (i.e., simple payback less than 5 years). Another one third of sites offered simple payback in less than 10 years using reasonable long-term fuel rates; these projects represent an additional 99 megawatts of capacity and also merited follow-up action.

Each site requesting a screening provides background information about their existing systems, principal type of business, and energy use and costs. In return, they receive a brief, two-page report summarizing the potential for cost and energy savings using CHP technology at their site. A preliminary screening is usually performed using limited information from the site. Sites with strong potential for cost and energy savings, commitment, and a source or partner for project funding may qualify for additional FEMP technical assistance to verify CHP potential and obtain best-value CHP projects. ADD CHP staff can consider the cost/benefit of specific CHP configurations and local regulations, incentives, and grid interconnection issues when sites have appropriations or are willing to partner with energy services companies or utilities to finance their projects.

The ADD CHP team is available to provide technical support directly to sites or through project facilitators for appropriations-funded, energy savings performance contract, utility energy service contract, or other financed projects. FEMP Regional Office representatives can help agency project teams assess their site's CHP potential and consider factors such as:

- local air quality requirements;
- optimal configuration choice based on qualification requirements for



incentives and the details of standby tariffs;

- parametric analyses for multiple scenarios to consider internal combustion engines, gas turbines, microturbines, and fuel cells; and
- applying recovered waste heat as steam or hot water compared to using waste heat to produce chilled water for air conditioning.

The preliminary screening report prepared for the site includes recommendations on whether further action toward project development is warranted. Because energy prices can be volatile, the report also includes a chart illustrating how simple payback for the hypothetical CHP plant varies with changes in key parameters: level of heat use and costs of natural gas and electricity. ADD CHP staff are available to discuss the analysis should any questions arise.

A positive screening report gives agency staff evidence to present to their management to motivate further

consideration of a CHP project.

Screening reports also help Federal sites understand what affects CHP economics, one of the key factors being the recovery and use of waste heat from turbine or engine generators. Reports include a graph that illustrates how the simple payback period for a system decreases as the amount of waste heat effectively used by the site increases. Simple payback is calculated using current energy costs and assuming that recovered heat is used to replace purchases of boiler fuel or electricity for heating and cooling. Since this is a critical assumption, results are presented depicting payback with 100, 75, 50, 25, and 0 percent use of the recoverable waste heat.

For more information, please see FEMP's web site at www.eren.doe.gov/femp/techassist/der_resources.html#technical. For additional information, please contact Shawn Herrera, FEMP DER Program, at 202-586-1511 or Shawn.Herrera@ee.doe.gov, or Keith Kline, ADD CHP Team Lead, at 865-574-4230 or klinekl@ornl.gov.

Utility Efficiency Projects Top \$1.1 Billion

Ever since the Energy Policy Act of 1992 gave Federal agencies authority and encouragement to partner with utility companies, the level of investment for energy efficiency projects has continued to grow. During the past decade, 60 electric and gas utilities have implemented efficiency projects and upgrades at Federal facilities, investing more than \$700 million through utility energy service contracts (UESCs). When coupled with \$400 million of Congressional appropriations leveraged by utility-financed investment, the total is now more than \$1.1 billion. This investment is saving the Federal government an estimated \$160 million per year. The positive trend is expected to continue, resulting in additional utility energy efficiency projects with Federal agencies and facilities.

A voluntary data reporting effort from utilities and agencies has been underway for more than 4 years, which has allowed FEMP to examine important trends in the UESC process. UESC activity is about evenly split between defense and civilian agencies. The Department of the Navy, U.S. Marine Corps, and Department of the Air Force have completed the largest projects, followed by the General Services Administration, the Department of Veterans Affairs, and the Department of the Army. Another 18 agencies have also availed themselves of this financing mechanism.

Another interesting trend in project activity is the rate of investment in UESCs over the last several years as shown in the graph (see below left). The data reveals a trend of growing private sector investment in UESC projects.

Agencies have applied utility investments in 10 technology categories, listed in descending order by expenditure:

- comprehensive upgrades,
- lighting and mechanical system upgrades,
- lighting retrofits,
- cogeneration/combined heat and power,
- mechanical system upgrades,
- boilers/chillers retrofits,
- steam system upgrades and improvements,
- controls,
- energy and water combined projects, and
- installation of heat pumps.

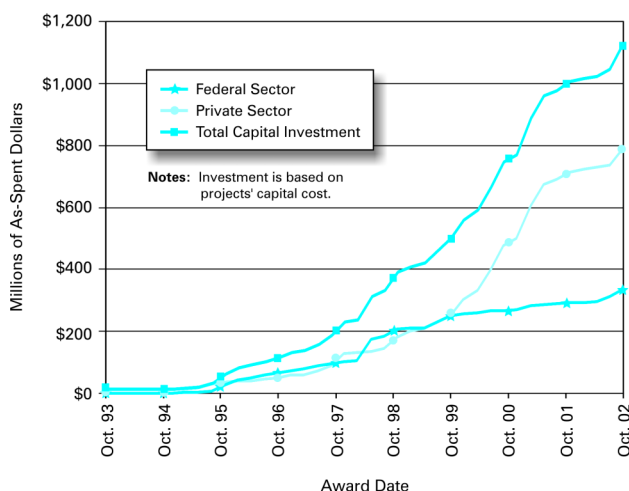
Along with lower commodity bills, the quiet success story of these investments is greater comfort and productivity for Federal personnel.

FEMP actively encourages partnerships between agencies and utility companies to continually improve the ease and accessibility of UESCs. FEMP regularly brings partners together under the auspices of the Federal Utility Partnership Working Group (FUPWG) to share best practices and to facilitate additional utility-financed projects. Membership in FUPWG requires nothing more than an interest to share and learn. The next FUPWG meeting is scheduled in Tampa, Florida, on November 19-20, 2002.

FEMP, along with staff from the General Services Administration, also conducts training workshops on implementing projects through the use of UESC and areawide contracting for Federal contracting officers and energy managers. (See page 25 for workshop schedule.)

Despite their apparent success, UESCs are still an underutilized procurement tool in the Federal government. To help remedy this, FEMP is increasing its outreach to utilities. At present, nearly all the utilities that offer the UESC financing vehicle are investor-owned. FEMP is initiating contact with investor-owned utilities that do not currently offer UESCs to encourage them to consider offering that service to their Federal

Cumulative UESC Project Investment



Source: DOE's Pacific Northwest National Laboratory

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Natural Gas LDCs: Options for Utility Financing

Federal agencies that have numerous alternative financing options and potential partners available to them are in the strongest position to develop high-quality energy efficiency, renewable energy, and water conservation projects at their facilities. FEMP is working to expand agency options to include utility companies that have not traditionally participated in these projects in the past, but have much to offer their Federal agency customers.

Natural gas local distribution companies (LDCs) are largely untapped potential partners for Federal facilities to work with under utility energy service contracts (UESCs). FEMP has been actively encouraging gas LDCs to partner with their Federal customers on these efforts.

A workshop for natural gas LDCs interested in pursuing partnerships with Federal agency customers was held in Atlanta in 2001 and hosted by DOE's Atlanta Regional Office. Participants networked with potential partners, received guidance on developing UESC projects, and were made aware of FEMP resources and contacts. Workshop evaluations indicated that the objective of the workshop was fully met—participants received information and guidance needed to help them develop programs to serve the Federal market for comprehensive energy efficiency, renewable energy, and water projects through UESCs.

Presentations from natural gas LDC experts, such as Stan Knobbe of Southern California Gas Company and others, who have organized special business units in their companies to serve the Federal market, provided honest answers about the challenges of getting started and also showed beyond any doubt that opportunities exist for these programs to be successful. Participants especially appreciated the opportunities to speak with LDC representatives who had extensive experience with UESC projects. Southern California Gas Company, Nicor, Inc., and Onsite Energy Corporation's case studies helped participants identify several potential avenues for getting started.

Following the workshop, natural gas LDC representatives pursued the use of General Services Administration (GSA) areawide contracts with GSA representatives, which allow utility



Brian Magden of the General Services Administration encourages natural gas LDCs to enter into UESC partnerships with their Federal agency customers at a FEMP-sponsored workshop in New York City, June 2002.

service providers to enter into UESC projects with Federal agency customers within the utility's franchise territory. FEMP continues to follow-up with workshop contacts as initial projects are identified to see if additional assistance would be helpful.

The positive comments and evaluation from participants of the Atlanta workshop resulted in a similar workshop in the Northeast Region, which was held in June 2002 in New York City. Hosted by DOE's Northeast Regional Office and co-sponsored by Keyspan Energy Delivery, the New York workshop helped to generate interest in CHP at two large Federal facilities in Connecticut.

Natural gas LDCs interested in pursuing UESC projects with their Federal agency customers or Federal agency sites interested in working with their local gas LDC should contact their FEMP Regional Office Representative (see list of DOE Regional Offices on contacts page of FEMP Focus). For additional information, please contact David McAndrew of FEMP at 202-586-7722 or david.mcandrew@ee.doe.gov, or Julia Kelley of Oak Ridge National Laboratory at 865-574-1013 or kelleyjs@ornl.gov.

UTILITY EFFICIENCY PROJECTS TOP \$1.1 BILLION (continued from previous page)

customers. FEMP has also recently made special efforts to increase the participation of local gas distribution companies and rural electric cooperatives. (See article above.)

FEMP's web site at www.eren.doe.gov/femp/utility provides information and resources available to agencies seeking utility-financed solutions to their energy problems. A great way to learn more about UESCs is to contact the Energy Efficiency and Renewable Energy (EREC) Clearinghouse at 800-DOE-EREC to request a free copy of FEMP's 15-minute UESC videotape. The videotape is an effective tool to encourage agencies and utilities to build energy efficiency partnerships.

For more information, please contact David McAndrew, FEMP Utility Team Leader, at 202-586-7722 or david.mcandrew@ee.doe.gov.

Comparing Cost Elements in ESPCs and UESCs

Many Federal agencies are finding alternative financing vehicles useful tools for meeting their energy goals. Federal investments in energy efficiency improvements through energy savings performance contracts (ESPCs) and utility energy service contracts (UESCs) have grown to nearly \$2 billion since agencies began using them in the late 1980s.

Many Federal energy managers who have considered implementing alternatively financed energy projects have wondered which financing mechanism they should use. Examining the cost elements of ESPCs and UESCs reveals that they are actually more similar than different, but also highlights distinctions that can help agencies determine which financing vehicle will best address their needs.

Similarities—Cost Elements in All Energy Projects

ESPCs and UESCs are more similar than different. With either financing vehicle, your energy project will involve expenses for project development (i.e., energy surveys, feasibility studies), engineering design, labor and materials for construction, and finance costs. Under both types of contracts, the service provider—energy service company (ESCO) or utility—may have an in-house engineering team or may subcontract engineering tasks. Both ESCOs and utilities generally subcontract construction/installation of energy conservation measures (ECMs) and have access to the same sources of equipment, supplies, and financing.

The most significant distinctions between ESPCs and UESCs are a function of which goods and services are provided, and what payment methods you choose. There is no indication that one group

charges more than the other for equivalent goods and services. As a representative of the Federal government, you have the tools and the ability to perform due diligence determinations of fair and reasonable pricing. Even though formal competitions for delivery order awards are not required in ESPCs and UESCs, there is real competition among the businesses that are trying to attract Federal customers for their energy services.

The majority of costs in energy projects fall into these categories:

Implementation costs account for most expenses—for energy surveys, feasibility studies, engineering design, and construction including labor and materials.

“Other” costs generally incurred in energy projects are for project management and administration, taxes, insurance, permits, and licenses.

Mark-ups are applied to energy or construction projects procured by the Federal government. The mark-up, usually a set percentage of the project implementation cost, is added to the project price to cover non-project-specific overheads such as general administration and marketing. The mark-up is readily apparent in Super ESPC delivery orders because the contracts require that it be shown as a separate item on project financial schedules. Maximum mark-ups were negotiated between DOE and the ESCOs who were awarded the prime ESPC contracts. The mark-up on any particular Super ESPC project is negotiable between the agency customer and the ESCO, and mark-ups have been well below the maximums in most delivery orders.

ESCOs, utilities, and other companies that provide energy services generally incur the same kinds of expenses in providing these services, and must recoup those expenses to stay in business. Mark-ups may not always be listed in UESC task orders (or non-financed construction contracts), but they are always included in the price. The mark-up can and should be requested as a line item in the UESC cost proposal if the Federal agency chooses to have it specified.

Differences in Project Development Practices

Although the same types of expenses are generally incurred in all energy projects, there are notable differences in the ways project development activities and costs are handled. The price of Super ESPC delivery orders includes all project development expenses (for marketing, energy surveys, feasibility studies, development of initial and final proposals, etc.), either as line items or in the mark-up.

UESCs provide agencies with a little more flexibility regarding the payment of project development costs. Agencies may either finance project development costs with the delivery/task order for complete design and construction/installation of ECMs or proceed step by step and pay as they go. Under the pay-as-you-go strategy, the utility may, at the agency's request, complete an energy audit (often free) and feasibility study, and the agency would agree to an established fee for those services. Next the agency may issue a task order to the utility for advancing project design to 30 percent completion and developing specifications

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to put out for bids. The agency would again pay for each task separately, or proceed with the project and roll all the costs into the financed amount. The important aspect to remember is that this process is subject to negotiation and provides flexibility based on the needs of the agency and the utility.

These different project development practices give agency customers several choices. Those who prefer to proceed step by step and pay for project development costs up front rather than finance those costs will pay less interest overall. Those who can't or don't choose to pay development cost up front can finance all costs in one package. The fact that project development costs generally are included (and financed) in ESPCs but may not be included in UESCs helps to explain why direct comparison of similar projects sometimes makes ESPCs seem more expensive than UESCs. When doing such comparisons make sure you are comparing projects with similar cost structures.

Savings Guarantees and Measurement & Verification

Savings guarantees and measurement and verification (M&V) of savings, which are required in Federal agencies' ESPC agreements and are included in some UESCs, affect project costs directly and indirectly. M&V requires effort and expense—to develop an M&V plan, install meters or other instrumentation, gather data, and document and report results. Annual M&V costs in Super ESPC projects have averaged about 3.5 percent of guaranteed annual savings.

While needs and priorities vary among agency sites, M&V is regarded by many as a wise investment and an essential element of an overall energy strategy. Federal project experience is providing evidence that potential energy and cost

savings are unlikely to be realized even initially, and especially in the long term, without planned and executed follow-up such as with maintenance and M&V.

A potential indirect cost of guarantees and M&V is slightly higher interest rates. If the lender sees these requirements as representing any risk that the ESCO might fail to fulfill the contract (i.e., risk that the lender might not be paid), that risk may be priced into the interest rate. To mitigate the risk, most ESCOs guarantee less than 100 percent of estimated savings, and agencies can use M&V plans that are practical and simple, but sufficiently rigorous to reliably verify that the equipment is operating as intended.

Performance Period Services—M&V, O&M, and R&R

Services (including M&V) that are provided to the agency during the term of the ESPC or UESC are handled in a variety of ways by agency customers. In both ESPCs and UESCs, performance period services such as operations and maintenance (O&M) and equipment repair and replacement (R&R) are negotiable and can be assigned to the ESCO/utility, agency staff, or subcontractors. In Super ESPC projects, performance period expenses always include M&V, and the ESCO is always responsible for defining the maintenance program and verifying execution. Generally the ESCO is responsible for R&R through extended equipment warranties.

Because ESCOs guarantee savings in Super ESPC projects and must also ensure that specific standards of service are achieved (i.e., temperatures, lighting levels, etc.), they usually wish to exert some control to ensure that the equipment is properly maintained and operated. These O&M services increase the expenses incurred by the ESCO,

which, in turn, increase the ESCO's cost to the agency. Commonly the agency operates and maintains the equipment with ESCO oversight, which recognizes both parties' positions, but Super ESPCs allow agencies to negotiate whatever arrangement best addresses their needs. Performance period services are included much less frequently in UESCs than in ESPCs, which contributes to the longer terms typical of ESPCs. Performance period services can be included in UESCs through negotiations with the local utility if the agency desires them.

Interest and Finance Costs

Financiers indicate that interest rates for energy projects are more dependent on project size, length of contract term, and perceived risk than on whether financing is through an ESPC or UESC. The experience and credit rating of the ESCO or utility are very important factors as well. Overall, interest rates on UESCs have been slightly lower than interest rates on ESPCs, primarily because savings guarantees and M&V procedures, which increase investor's perceived risk (depending on the contract language) are less common in utility projects, and contract terms are generally longer for ESPCs than UESCs.

Qualitative Considerations

FEMP endorses both ESPCs and UESCs and encourages agencies to use the financing mechanism that delivers the best value for their facilities, based on their own needs and priorities. There are benefits and considerations in either alternative. UESCs often provide more flexibility to proceed with projects that are of smaller scope and size and the UESC contracting process is generally more flexible, with more elements subject to negotiations between the parties. EPSCs provide a more prescriptive contracting process and a

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New Tool for Estimating O&M Costs in Financed Energy Projects

A new resource is helping Federal facility and energy managers estimate operations and maintenance (O&M) costs and savings for their financed energy projects. The online, interactive *HVAC Construction and Maintenance Cost Database* allows users to enter data on their own projects and query the database to obtain detailed information on actual O&M and construction costs for a wide variety of HVAC system types.

With support from FEMP, DOE's Oak Ridge National Laboratory (ORNL) developed the database to collect data on geothermal heat pump (GHP) projects. FEMP's GHP team at ORNL, which provides technical and project financing assistance to Federal facilities implementing GHP projects, had been lacking information on construction and O&M costs for GHP systems. Estimating guides such as R.S. Means are standard reference tools for more common HVAC systems, but until now reliable information on GHPs has been virtually nonexistent. The database now includes data for conventional HVAC systems as well as GHPs.

ORNL worked closely with the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) to develop the database and assist the engineering society with updating its 25-year-old, obsolete data tables on maintenance costs and equipment service life for all varieties of HVAC equipment. ASHRAE recently approved funding for a research project to support accelerated expansion and development of the database, and if the research is successful, will move to commercialize the database tool.

FEMP project facilitators are already using the database to evaluate the accuracy of construction and O&M costs in Federal energy savings performance contract and utility energy service contract projects. "The GHP data is crucial in our review of construction and maintenance costs identified in proposals for financed energy projects," says Bob Baugh, a FEMP Project Facilitator with ORNL. "With little reliable GHP cost information available in standard estimating sources, the database helps us and our Federal customers verify the reasonableness of contractor costs."

Data are provided on a voluntary basis, and users must provide data for at least one project before they are allowed to gather information from the database through queries. The database also contains data collected via a seed project conducted by ORNL. All data points are closely scrutinized by an ORNL staff engineer before they are posted in the public database. Currently, the database contains cost data for 93 records on GHP maintenance, 98 records on GHP construction, 29 records on conventional HVAC maintenance, and 18 records on conventional HVAC construction. The more records entered, the more valuable the database will be for all!

The HVAC Construction and Maintenance and Cost Database is available at http://public.ornl.gov/BTC_MIC/logon.cfm. For more information about the database, please contact Melissa Madgett, database administrator, at 865-576-3373 or madgettmg@ornl.gov. For information about the GHP Super ESPC, please contact Doug Culbreth of DOE's Atlanta Regional Office at 919-782-5238 or carson.culbreth@ee.doe.gov.

COMPARING COST ELEMENTS IN ESPCS AND UESCS

(continued from page 11)

longer contract term, which may be required for the viability of some projects. Additionally, ESPCs are available nation-wide while UESCs require a local utility that is willing and able to complete the project. A best-value project will provide precisely the services and goods that you need at a fair price, and will not require you to pay for services you don't need.

Most acquisition teams choose a financing vehicle and service provider based on qualitative concerns. Their choices often turn on questions such as: Among the available options, where will we find the expertise and approach we're looking for? Which has the best record of success relative to our needs? Perhaps the most important question is: With which service provider can we develop the best possible partnership and most productive working relationship? Remember, whichever financing option agencies choose, FEMP offers a wide variety of financing workshops and can provide experienced project facilitators to guide you through the entire process of developing and implementing a project.

For more information, please contact Tatiana Strajnic, FEMP Project Financing Team Lead, at 202-586-9230 or tatiana.strajnic@ee.doe.gov, or David McAndrew, FEMP Utility Team Lead, at 202-586-7722 or david.mcandrew@ee.doe.gov.

Your Alternative Financing Questions Answered

I am interested in using FEMP's Super Energy Savings Performance Contract (ESPC) Program to finance energy retrofit projects at my facility. Are there any costs associated with implementing a Super ESPC project?

FEMP assists Federal agencies through the needs assessment and project planning phases as well as all of the phases up to and including the review of an initial proposal without any charge to the agency. The assessment and project planning phases consist of initial consultations, site visits, and preliminary identification of potential improvements in Federal energy efficiency and FEMP service needs such as alternative financing implementation or technical assistance. All services are funded through FEMP's appropriated funds.

If the agency decides to pursue alternative financing, an interagency agreement must be executed which allows for transfer of funds from the agency to FEMP's reimbursable account.

If agencies decide to proceed beyond the initial proposal using an ESPC, they are charged for additional FEMP services. This includes technical support to agencies for investment-grade audits, detailed energy surveys, technical and administrative services, design assistance, negotiation and award of delivery orders, implementation of projects, and post-installation measurement and verification.

How do I obtain Super ESPC project facilitation support from FEMP and what support would a project facilitator provide to my agency?

The assistance of a project facilitator is formally obtained via an Interagency Agreement and work order. Both forms are available to download from FEMP's ESPC web site at www.eren.doe.gov/femp/financing/espc/project_facilitation.html.

An experienced FEMP project facilitator assigned to each Super ESPC project (as requested) provides assistance with technical, financial, and contractual matters and guides the agency through the entire process of developing, awarding, and verifying savings from the Super ESPC project.

The project facilitator also reviews price and technical proposals, drafts the agency's delivery order request for proposal, and provides other services as requested. For more information about FEMP assistance provided to Super ESPC projects, please see www.eren.doe.gov/femp/financing/espc/fempassistance.html.

What questions do you need answered? FEMP wants to provide the most useful information possible, but we need your help to achieve this! Please submit your questions via e-mail to Tatiana Strajnic of FEMP at tatiana.strajnic@ee.doe.gov.

Farm Act Provides Preferred Procurement for Biobased Products

Section 9002 of the Farm Act of 2002 creates a new mandate for Federal procurement of biobased products—commercial or industrial products that are composed, in whole or in significant part, of biological products, renewable domestic agricultural materials, or forestry materials. Federal agencies are to extend procurement preference to items composed of the highest percentage of biobased products practicable.

Section 9002 is the mandatory extension of Executive Order 13101, which encouraged voluntary Federal procurement of biobased products. The new mandate is similar to the approaches followed for recycled-content products and environmentally-preferred products in Executive Order 13101. The mandate requires Federal agencies to:

- establish a biobased products preference program,
- create an agency promotion program for biobased products, and
- annually review and monitor the effectiveness of the preferred procurement program.

Several deadlines apply to the mandate:

- **By November 13, 2002**, the Department of Agriculture (USDA) will publish guidelines for procuring agencies to use to comply with the mandate.
- **By May 13, 2003**, USDA will issue criteria to determine which products qualify as biobased products.
- **By November 13, 2003**, Federal agencies will develop a procurement program that specifies preferred purchases of biobased products.

USDA will issue criteria for the following product categories:

- absorbents/adsorbents,
- adhesives,
- alternative fuels/fuel additives,
- bioplastics/polymers/films,
- construction materials,

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Two GSA Buildings in New York Powered by 100 Percent Wind Energy

The General Services Administration (GSA) recently announced that two of its facilities in New York State—the Binghamton Federal Building and the Pirnie Federal Building—are now powered entirely by wind-generated electricity from the Fenner Wind Farm in New York. GSA purchased 1,100 megawatthours of wind energy annually for 3 years from Community Energy, Inc., through an agreement with Select Energy, Inc. With this purchase, the Binghamton and Pirnie Federal buildings became the first two GSA owned and operated Federal facilities in the country powered solely by wind energy.

The green power purchase covers 100 percent of both facilities' electricity usage for 34 months, beginning July 2002. The contract was awarded by GSA's Energy Center of Expertise and is administered by the GSA's Northeast and Caribbean Region. The administrative fees GSA collects from its power procurement customers in New York fund the green power premium. The green power premium is \$0.0175 (1.75 cents) per kilowatthour.

Karl Reichelt, GSA Regional Administrator, said that "... using wind power conforms to one of GSA's strategic goals of being environmentally responsible as a Federal government agency. The GSA is pleased to uphold President Bush's commitment to protecting the environment by exploring alternative energy uses."

The wind power supplied by the 30-megawatt Fenner Wind Farm went online last fall with funding support from the New York State Energy Research and Development Agency. GSA's green power purchase is expected to decrease annual emissions of the following pollutants: 1.7 million pounds of carbon dioxide; 3,322 pounds of nitrogen oxides; and 8,437 pounds of sulfur dioxide. Carbon dioxide is a major greenhouse gas and sulfur dioxide contributes to acid rain and regional haze. Nitrogen oxides, when mixed with hydrocarbons, heat, and sunlight, produce ground level ozone and smog.

The Binghamton and Pirnie Federal buildings have been accepted into the Green Power Leadership Club of the Environmental Protection Agency's Green Power Partnership, a

voluntary program working to reduce the environmental impact of electricity generation by fostering the development of green power. Partners in this program include Fortune 500 companies, states, Federal agencies, and universities from around the country.

GSA's renewable energy purchase supports the Federal renewable energy goal, which calls for the equivalent of 2.5 percent of Federal facility electricity consumption to be derived from new renewable energy sources by FY 2005.

For more information, please contact Brian Magden of GSA at brian.magden@gsa.gov or 212-264-0561, or David McAndrew of FEMP at 202-586-7722 or david.mcandrew@ee.doe.gov.

FARM ACT PROVIDES PREFERRED PROCUREMENT FOR BIOBASED PRODUCTS

(continued from page 13)

- inks,
- landscaping materials,
- lubricants/functional fluids,
- paints/coatings,
- personal consumer items,
- solvents/cleaners, and
- tree-free paper and packaging/alternative fibers.

Procurement of motor vehicle fuels and electricity are not subject to the biobased product mandate as these products are already addressed through other regulatory programs. Similarly, for recycled-content products, the biobased-product mandate will impose consistent requirements as those contained in Section 6002 of the Solid Waste Disposal Act.

Ten Federal agencies have formed the "Buy Bio Work Group," whose mission is to streamline the implementation of the preferred biobased product procurement mandate.

For more information, please contact Tom Snyder of DOE's Argonne National Laboratory at 202-488-2419 or tsnyder@anl.gov, or Michael Mills of FEMP at 202-586-6653 or michael.mills@ee.doe.gov.

Army Shows Renewable Energy Leadership in the Nation's Capital

The Department of the Army was recognized for their purchase of 19 million kilowatthours of renewable power on September 30, 2002 at the Seventh National Green Power Marketing Conference in Washington, D.C. Through a supply agreement with Washington Gas Energy Services, Inc., more than 8 percent of the electricity needs of the Walter Reed Army Medical Center, Fort McNair, and Adelphi Laboratories will be generated by a combination of wind energy and landfill gas resources through the end of 2004.

John Nerger, the Army's Director of Facilities and Housing said, "This purchase illustrates the Army's commitment to furthering the development of domestic renewable energy resources in this region. We are pleased to see the wind industry grow in the region and around the nation."

This is one of the largest Federal renewable power purchases and will assist the Army in achieving the goals of Executive Order 13123, as well as proposed Federal legislation that would mandate a renewable portfolio standard. "The Army's leadership will be felt nationally, and especially in the Washington D.C. region," added Harry Warren, President of Washington Gas Energy Services, the supplier of the 5 million kilowatthours of wind power and 14 million kilowatthours of landfill gas annually. "The Army joins other local and regional institutions making a commitment to renewable energy."

Community Energy, Inc. will provide the renewable energy to Washington Gas Energy Services through a marketing arrangement with Exelon. "The Washington Gas Energy Services green electricity product means cleaner air to breathe and greater energy independence, a win-win decision that the Army can be proud of," said Brent Alderfer, President of Community Energy.

The wind energy will be delivered from the Mountaineer Wind Energy Center (formerly known as the Backbone Mountain Wind Farm) in West Virginia starting January 2003. FPL Energy recently purchased the rights to the 66-megawatt wind farm, the largest wind energy facility to be built in the eastern United States, producing the equivalent electricity needed to power 20,000 homes each year. Compared to the same amount of conventional generation in the mid-Atlantic, this wind generation is estimated to avoid 200 million pounds annually of carbon dioxide emissions. That is equal to taking more than 14,000 cars off the road. FPL Energy is the nation's leader in wind energy generation, with 24 wind farms in 8 states. The Army will purchase the entire output of one of the Mountaineer facility's 1.5 megawatt wind turbines when construction is scheduled to be complete by the end of the year.

The landfill gas plants are located in Commonwealth Edison's service territory. The plants became operational after 1990, thus meeting the renewable



With a giant wind turbine blade as a backdrop, the Army and other local and regional institutions announce renewable energy purchases in Washington, D.C.

energy goal of Executive Order 13123 (see www.eren.doe.gov/femp/resources/renewableguide.html for the Federal renewable goal guidance).

The Defense Energy Support Center (DESC) coordinated the renewable power purchase for the Army. "We were delighted to assist the Army with this purchase and will include renewable power products for customers in upcoming electricity procurements," noted DESC Contracting Officer Larry Fratis.

For more information about renewable power purchases, please contact David McAndrew of FEMP at 202-586-7722 or david.mcandrew@ee.doe.gov; Chandra Shah of NREL at 303-384-7557 or chandra_shah@nrel.gov; or Bill Golove of LBNL at 510-486-5229 or whgolove@lbl.gov.

INNOVATIVE TECHNOLOGY

Brought to you in cooperation with the
Office of Energy Efficiency and Renewable Energy

A Promising New Technology— ElectroCeramescent Lighting

Most illuminated commercial signage utilizes conventional technologies, such as incandescent or fluorescent lamps, for its illumination. A promising new lighting technology, called ElectroCeramescent (E**Cer**) lamps may lead to dramatic power reduction and improved illumination. Developed by Meadow River Enterprises, Inc., in collaboration with the U.S. Department of Energy, the New York State College of Ceramics at Alfred University, Marshall University, and Osram-Sylvania, E**Cer** lighting reduces the power requirement for typical commercial signs by as much as 90 percent.

The typical efficiency of incandescent and fluorescent lights is 15 and 75 lumens per watt, respectively. While the efficiency of an E**Cer** lamp can be as low as 4 lumens per watt, even a low efficiency E**Cer** lamp uses dramatically less power than conventional light sources for a given task. E**Cer** signage is equally visible at lower overall power consumption, because the source of the light is directly viewed, rather than a reflection. A 4-foot x 14-foot sign using conventional T-12 high output fluorescent lamps would require 550 watts. E**Cer** technology reduces the power demand to less than 12.5 watts by forming letters and symbols with laser-cut E**Cer** lamp panels, thus lighting individual characters rather than the entire sign. Unlike incandescent and fluorescent lamps, the flat and uniformly lit E**Cer** lamp produces virtually no heat, glare, or halo even in adverse weather conditions, so little light is wasted. Reflected light configurations, widely used for illuminated signage, waste much of their energy in heat and by lighting the ground or sky—a significant source of light pollution.

The solution to light pollution lies in quality lighting systems that enhance nighttime ambiance rather than reproducing

inappropriate daylight conditions. A powerful design approach is to directly light the surface of objects that need to be visible with minimal use of reflected light, and matching its spectra to human eye sensitivities. Because the required light levels (and power demands) of signage can be remarkably low, surface light sources and associated fixture design are the critical parameters. E**Cer** lighting systems can dramatically reduce

continued on next page

ElectroCeramescent (E**Cer**) lighting is the result of 4 years of research and development completed in November 2001. The project was conducted through a \$1.6 million cooperative agreement with the U.S. Department of Energy (DE-FC26-99-FT40631) and Meadow River Enterprises of West Virginia.

Breakaway View

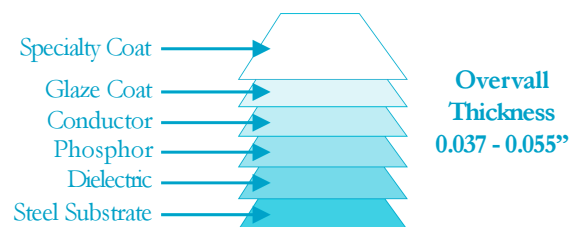


Figure 1. ElectroCeramescent Lighting Technology

Figure 1 above illustrates the basic design of an E**Cer** lamp panel. The lamp is comprised of a series of layers on a steel substrate. An electrical potential applied across the electrodes (the steel substrate and the transparent conductive layer) introduces a high voltage field across the phosphor layer, which causes electrons to accelerate to high energies and activate luminescent centers in the phosphor. Light is produced when the centers relax to their ground state. The E**Cer** panel can be driven by an AC power source over a wide range of voltages and frequencies. Transformers and inverters are used to convert the primary power source (e.g., utility, battery, solar) to an appropriate voltage (typically 90 to 250 volts root-mean-square) and frequency (usually 60 to 1,000 hertz) for optimum E**Cer** performance. Typical illumination levels are in the 1- to 10-foot-lamberts range.

unnecessary nighttime illumination, while cutting energy consumption and improving visibility. This produces a better, more visible sign with reduced energy use.

Applications

ECer lighting has inherent mechanical strength because of its ceramic thermal fusion and steel structure. As a result, **ECer** lamps are well suited for outdoor applications with high environmental stress. Landscape lighting applications (often termed “lightscaping”)—including entrance and exit signs, security warnings, building numbers, address markers, and pathway elements like flagstones, step edges, and corner markers—offer substantial market opportunities. Beyond the energy savings, **ECer** lamps provide aesthetic advantages as well. On walkways, for example, **ECer** lighting illuminates the path rather than the entire path area. The durability of the **ECer** ceramic-on-steel technology also permits rough handling and outdoor exposure without damage. Low power levels and long service life provide an attractive life-cycle cost, as well as an ideal lighting platform for usage with a wide range of conventional and alternative energy solutions; including: grid power, solar (photovoltaic), wind, battery, fuel cells, etc.

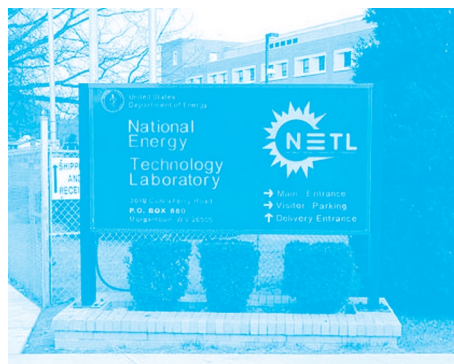
ECer lighting is also appropriate for many indoor applications for both residential and commercial buildings. Low area lighting levels can be combined with brighter **ECer** lighting for steps, lighted controls, and signs. Because they are so rugged, **ECer** lamps are also particularly well suited for locations prone to vandalism.

Costs

The initial cost outlay for **ECer** signage is comparable to conventionally lit products. With the added advantage that **ECer** signage can last up to 50,000 (or more) hours with little maintenance, life-cycle costs of **ECer** signs are significantly reduced. Their long service life reduces costs associated with frequent bulb replacement, an important factor for lighted signs that are difficult and/or costly to access. In applications where remote power is required to illuminate a sign, a solar-powered **ECer** solution could actually be less costly than conventional lighting alternatives.

There are approximately 19 million electric signs installed in the United States with total power consumption of about 17 billion kilowatthour per year.¹ The current operational cost of these signs is approximately \$1.7 billion per year. If all these signs used **ECer** technology, the energy cost could be reduced by at least 90 percent, with savings of approximately \$1.5 billion

per year or 15.3 billion kilowatthour. Cost savings from reduced energy consumption alone would more than repay the cost of the sign over its expected lifetime. When lower maintenance costs are included, the break-even point for replacing fluorescent and incandescent signs with **ECer** technology is approximately 5 to 7 years (depending on the labor costs associated with lamp replacement).



Solid-state ceramic light using Electro-Ceramescent lighting technology is displayed on a sign at DOE's National Energy Technology Laboratory in Morgantown, West Virginia

Testing

DOE's National Renewable Energy Laboratory has been conducting facility signage and pathway marker lamp testing for 3 years. Complete **ECer** sign assemblies have successfully completed thermal cycle testing over a temperature range of -20°F to $+120^{\circ}\text{F}$, as well as simulated rain exposure and total water immersion testing.

Conventionally-powered and solar-powered demonstration signage is currently being tested at four West Virginia State Parks as well as at DOE's National Energy Technology Laboratory in Morgantown, West Virginia. In a joint effort with the Nick J. Rahall, II Appalachian Transportation Institute and Marshall University, Meadow River Enterprises has developed, and is testing, a pair of “smart” **ECer** highway signs (designated for use on U.S. Interstate 64 in West Virginia). These informational signs have been designed to automatically respond to inclement weather by dramatically increasing their illumination intensity.

For more information regarding ElectroCeramescent (ECer) lighting technology, see the Meadow River Enterprises, Inc. web site at www.area125.com. For additional information, please contact Jim Brodrick of DOE's Office of Building Technologies at james.brodrick@ee.doe.gov, or Ted Collins of FEMP at theodore.collins@ee.doe.gov.

¹Assuming an average life of 15 years and an average cost of \$1,500 per sign, the installed illuminated sign base is on the order of 19 million signs.

Assuming an average power consumption of 200 watts per sign for 12 hours per day, 365 days per year, total annual power consumption is approximately 17 billion kilowatthours. Assuming a 2001 energy cost of \$0.1 per kilowatthour, the current operational cost of these signs (energy component only) is approximately \$1.7 billion per year.

Energy Efficiency and Peak Load Reduction Opportunities Available on FEMP's Utility Management Web Site

Faced with rising and volatile electricity and gas prices, Federal energy managers in many parts of the country are straining to manage their energy costs within current utility budgets. Simultaneously, many energy managers are thinking about how their agency can do its part to help maintain the reliability of the electricity grid in their region.

Federal customers have an array of energy efficiency and peak demand programs to assist them. Approximately 20 states have an estimated \$900 million to \$1.1 billion in public purpose funds available for energy efficiency projects alone per year. Additional financial incentives are available for demand response programs including more than \$10 million available through the New York State Energy Research and Development Authority and incentives offered by regional and state Independent System Operators.

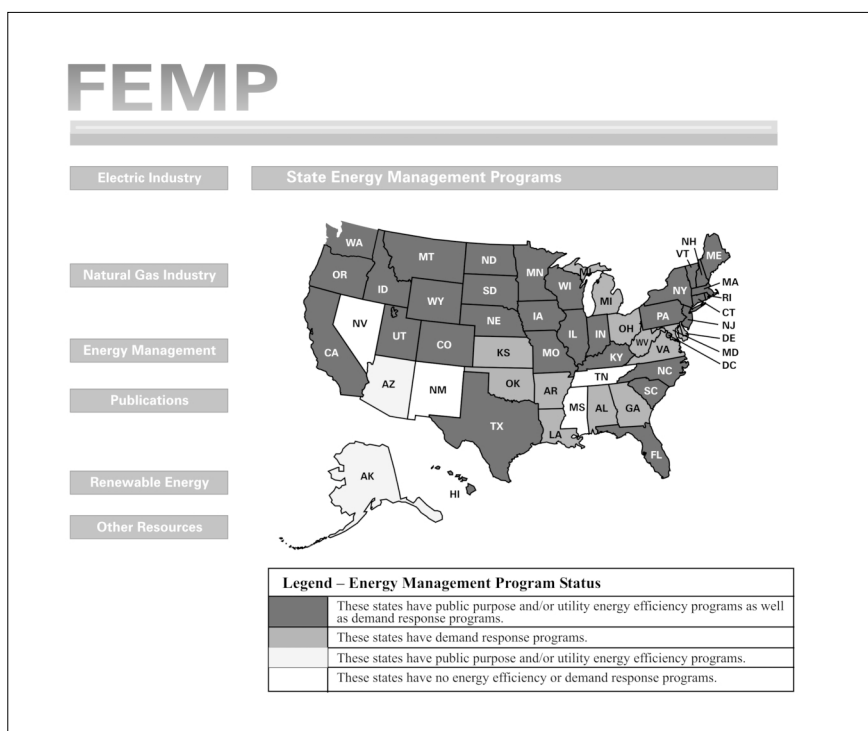
FEMP's Utility Management web site provides comprehensive, state-by-state information on opportunities for financial and technical support for energy efficiency, load management, and distributed generation projects. In the energy management section of the web site, the user is presented with a map of the United States and can click on the state for which they would like information. For each state, users can find descriptions of and links to programs providing:

- no-cost energy audits, design assistance, and engineering analysis;
- rebates and financial incentives for energy-efficient equipment, green building design, and distributed generation systems;
- rebates for energy management and energy information systems;
- real time pricing options and demand response programs; and

- other opportunities for financial and technical assistance with energy efficiency and load management.

With electricity industry restructuring, the funding and administration of energy efficiency and load management programs is changing in some states. To keep pace with these changes, the web site is updated semi-annually to provide Federal agencies with current information. Visit the web site at www.eren.doe.gov/femp/utility/energy_management.html and click on "Utility Management web site."

For more information, please contact David McAndrew of FEMP at 202-586-7722 or david.mcAndrew@ee.doe.gov, or Chuck Goldman of LBNL at 510-486-4637 or cagoldman@lbl.gov.



FEMP's Utility Management web site provides state-by-state information on the status of electric utility restructuring, guidance documents, and technical assistance options for procuring energy services, and information on green power and energy-efficiency programs offered in various states.

Plans for Energy 2003

"Real World, Real Solutions"

Already Underway



FEMP's Energy 2003 organizing committee held their first meeting July 15-17, 2002 at the Wyndham Palace Resort and Spa in Lake Buena Vista, Florida, the site of the upcoming 2003 workshop. Energy 2003 is sponsored by FEMP, and co-sponsored by the U.S. Department of Defense and the U.S. General Services Administration. The planning meeting was devoted to selecting tracks and sessions for the workshop.

Committee members, comprised of representatives from all sectors of the energy world, are now actively finalizing workshop sessions, and confirming speakers and moderators. Energy 2003 will feature the following session tracks:

- Acquisition;
- Alternative Financing;
- Energy Markets;
- Energy Security Using Distributed Energy Resources;
- Federal Leadership;
- Fundamentals for Energy Managers;
- Operations and Maintenance for Energy Efficiency;
- Navigating Energy Alternatives: Present and Future;
- New Technologies;
- Sustainable Building Design;
- Transportation—Driving into the Future with Alternative Fuels; and
- Water Resource Management.

Energy 2003 will once again feature interesting and informative tours of energy-related businesses in the Orlando area, and pre- and post-workshop seminars.

Mark your calendar now, and plan to attend Energy 2003, August 17-20, 2003. For complete information, visit the workshop web site at www.energy2003.ee.doe.gov.

For additional information, please contact Rick Klimkos of FEMP at 202-586-8287 or rick.klimkos@ee.doe.gov, or Jane Vander Linden of McNeil Technologies, Inc. at 703-921-1719 or jcvl@mcneiltech.com.

"Energy 2002 provided an enormous amount of valuable information from various perspectives including a comprehensive understanding of energy, conservation, and both long- and short-term energy conservation goals of our government and the marketplace."

— Gregory Kimble
Southern California Edison

Energy 2003 Organizing Committee

Advantek	Southern California Edison
Ch2M Hill, Inc.	Southern Company
Constellation Energy Source	TAC/CSI
Exhibit Promotions Plus, Inc.	Tampa Electric Co.
Florida Power & Light	TECO Energy, Inc.
Florida Solar Energy Center	U.S. Air Force
Harding ESE	U.S. Department of Defense/ Pentagon
Johnson Controls	U.S. Department of Energy— Headquarters, National Laboratories, and Regional Offices
McNeil Technologies, Inc.	U.S. Environmental Protection Agency
National Park Service	U.S. General Services Administration
Office of Management and Budget	U.S. Navy
Rebuild America	U.S. Postal Service

FEMP Awards 2002 Federal Energy Saver Showcase Facilities

Nineteen outstanding Federal facilities were recently awarded Federal Energy Saver Showcase designation. Each facility receives a plaque notifying visitors that they are entering a Federal government building that uses energy and water wisely and saves taxpayer dollars. These 19 facilities are expected to save the government 109 billion Btu, or about \$2 million in energy costs per year.

Since 1995, FEMP has recognized more than 80 facilities across the country as Federal Energy Saver Showcases. Located throughout the nation, this year's showcase facilities utilize technologies and strategies that range from low-energy building design and construction to geothermal heat pumps and distributed energy resources. Each facility nominated by their respective agencies features energy efficiency, renewable energy, or water conserving technologies designed to save natural resources and reduce operating costs.

It was a successful year for the Department of Defense, with 9 of the 19 designated showcase facilities representing the Navy, Army, Air Force, and Marines. DOE received five showcase awards this year, due in part to the efforts of several of its National Laboratories. Other Federal agencies receiving awards include the Department of Commerce (NOAA), the Department of Health and Human Services (HHS), the Department of Transportation (FAA), the Environmental Protection Agency, the General Services Administration, and the U.S. Postal Service. FEMP commends all the individuals and agencies who have contributed to the successful implementation of these projects. The following are brief descriptions of each showcase facility designated for 2002.

U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service Honolulu Laboratory Honolulu, Hawaii

With the redesign of an existing research laboratory, this project makes use of low-energy building design strategies, efficient technologies, and renewable energy. The project team is striving to attain a gold rating certification under the Leadership in Energy and Environmental Design (LEED™) program for

the facility through the use of such strategies as natural daylighting, solar water heating, liquid desiccant dehumidification, occupancy sensors, and a new building management system.

U.S. Department of Defense—Air Force Aircraft Hangars 450, 452, 454, and 456 at Columbus Air Force Base Columbus, Mississippi

Implemented through an energy savings performance contract covering four aircraft hangars and more than 74,000 square feet of building space, energy-efficient lighting retrofits and replacement of existing hot air furnaces with energy-efficient infrared heaters improve occupant comfort while reducing energy use.



An aircraft hangar at Columbus Air Force Base with recently installed energy-efficient lighting.

U.S. Department of Defense—Air Force Defense Information Systems Agency / Defense Enterprise Computing Center Ogden Hill Air Force Base Ogden, Utah

Energy efficiency improvements for this computer operations facility included the replacement of several old, inefficient chillers with newer, high-efficiency units, and installation of variable frequency drive pumps and a new direct digital controls system. Additionally, a new chemical feed system allows reuse of 50 percent of the cooling water.

U.S. Department of Defense—Air Force Military Family Housing at Charleston Air Force Base Charleston, South Carolina

Charleston Air Force Base replaced 885 conventional air conditioners and gas furnaces with geothermal heat pumps in their family housing units. This alternatively financed project

continued on next page

eliminates the need for natural gas for heating, resulting in demand reductions of 42 percent and overall energy savings totaling 30 percent.

**U.S. Department of Defense—Army
Arizona Army National Guard EcoBuilding
Phoenix, Arizona**

This unique facility is a true showcase of sustainable design and an example of how the Federal sector can lead by example. The 5,200-square-foot office facility uses natural daylighting, passive solar design strategies, recycled materials, solar-powered evaporative cooling, rainwater harvesting and collection, and 12 kilowatts of photovoltaic power.

**U.S. Department of Defense—Army
Building 110 at Watervliet Arsenal
Watervliet, New York**

Natural gas engine driven air compressors serving the Arsenal's industrial shop facilities were replaced with efficient electric motor driven units, saving an average of \$60,000 per year. In a demonstration of the success of this unique and straightforward project, it has already been replicated at the Picatinny Arsenal.

**U.S. Department of Defense—Army
Cleland Multipurpose Sports Complex
Fort Bragg, North Carolina**

An energy savings performance contract project completed at this ice rink and sports complex resulted in energy savings exceeding 40 percent per year. The use of high-efficiency metal halide lighting, a new desiccant dehumidification air handling unit, variable frequency drive pumps, a reflective ceiling system, and a new energy management control system saves more than 1 million kilowatthours per year.

**U.S. Department of Defense—Marine Corps
Laurel Bay and Pine Grove II Housing at Marine Corps
Air Station Beaufort
Beaufort, South Carolina**

Through a utility energy services contract, 2,500 tons of existing HVAC systems and hot water heaters were replaced with energy-efficient geothermal heat pumps in family housing units at this Marine Corps installation. The geothermal units reduce energy consumption by more than 40 percent and reduce carbon dioxide emissions by approximately 11 tons per year.

**U.S. Department of Defense—Navy
Naval Medical Center San Diego
San Diego, California**

A host of energy-efficient technologies including renewable energy were financed through a utility energy services contract at this showcase facility. Energy-efficient lighting, new high-efficiency HVAC systems, direct digital controls, adjustable speed drives for fans and pumps, solar swimming pool heating, and low-flow plumbing fixtures result in significant annual energy and water savings for the Navy.

**U.S. Department of Defense—Navy
Photovoltaic Covered Parking at Building 652
Naval Air Station North Island
San Diego, California**

As part of their facility demand reduction efforts, Naval Air Station North Island is constructing a new 750-kilowatt photovoltaic array to provide covered, shaded parking and more than 1 million kilowatthours of energy per year. The system, which may be the largest photovoltaic installation of its kind, is being partially financed through an energy savings performance contract.

**U.S. Department of Energy
Bechtel Hanford Headquarters
Richland Corporate Center
Richland, Washington**

Building energy consumption has been reduced by almost 15 percent and water use has been reduced by 5 percent through the implementation of off-the-shelf technologies and improved system operations. Specifically, savings were achieved through the use of lighting timers, new HVAC operating parameters, sprinkler adjustments, and low-flow plumbing fixtures.



DOE's Bechtel Hanford Headquarters in Richland, Washington, uses an array of energy- and water-saving technologies.

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FEMP AWARDS 2002 FEDERAL ENERGY SAVER SHOWCASE FACILITIES

(continued from page 21)

U.S. Department of Energy Fermi National Accelerator Laboratory Main Injector 8 GeV Beamline Batavia, Illinois

Radical new concepts in accelerator design have completely eliminated the use of non-renewable energy at the Fermi National Accelerator Laboratory, Main Injector. The use of permanent magnet electromagnetic displacement has dramatically reduced energy and water use, as well as maintenance requirements.

U.S. Department of Energy Lawrence Berkeley National Laboratory Building 46A – Engineering Division Offices Berkeley, California

LBNL has already implemented a number of energy and water efficiency strategies reducing energy consumption by 35 percent compared to 1985 and water consumption by 65 percent compared to 1988 levels. Recent installations of LBNL's Berkeley Lamp, which uses 25 percent of the power of a 150-watt incandescent bulb without sacrificing luminous output, results in additional savings.

U.S. Department of Energy National Renewable Energy Laboratory Thermal Test Facility Golden, Colorado

This energy-efficient research facility makes use of passive solar design, high-efficiency lighting with natural daylighting, two-stage evaporative cooling, variable speed drives, instantaneous water heating, xeriscaping, and a whole-building energy management control system. A true showcase of innovation, the facility has received several awards including an American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Technology Award, and has been featured in several publications including the *ASHRAE Journal* and *Solar Today*.

U.S. Department of Energy Oak Ridge National Laboratory Buildings Technology Center Oak Ridge, Tennessee

Already designated as an ENERGY STAR® building, this showcase facility also generates its own power. A new distributed generation system installed at the Buildings

Technology Center consists of 8.5-kilowatts of photovoltaic power, a 30-kilowatt microturbine, and an ultra-capacitor power system that supplies almost 35 percent of the building's total electricity use.

U.S. Department of Health and Human Services Indian Health Service David C. Wynecoop Memorial Clinic Wellpinit, Washington

Combining new high efficiency HVAC systems, energy-efficient lighting and occupancy sensors, low-e windows, additional exterior wall and ceiling insulation, and new plumbing fixtures with improved preventive maintenance practices have resulted in energy savings of 56 percent per gross square foot.

U.S. Department of Transportation Federal Aviation Administration Ft. Lauderdale/Hollywood Air Traffic Control Tower Fort Lauderdale, Florida

Although air traffic control towers tend to be energy intensive facilities, the FAA still found opportunities for substantial annual energy savings. Extensive energy efficiency improvements included the installation of new HVAC equipment, a reflective roof coating, ENERGY STAR® appliances, and highly efficient T8 lamps and electronic ballasts.

U.S. Environmental Protection Agency and U.S. General Services Administration EPA New England Regional Laboratory North Chelmsford, Massachusetts

Thanks to a collaborative effort between GSA and EPA, this showcase is a prototype for future EPA Laboratories and a potential gold-rated Leadership in Energy and Environmental Design (LEED™) facility. The Laboratory incorporates natural daylighting, highly efficient HVAC systems, a building-integrated photovoltaic sunshade, recycled and reused materials, and is electrified with 100 percent green power.

U.S. Postal Service Marina Processing and Distribution Center Inglewood, California

A recently installed 127-kilowatt, roof-mounted, grid-connected solar photovoltaic system is coupled to an energy management control system, optimizing control of the cooling system and solar energy generation. It is expected to save almost 300 megawatthours per year and reduce the facility's peak demand by about 10 percent.

For more information, please contact Trina Masepohl of NREL-FEMP at 303-384-7518 or trina_masepohl@nrel.gov.

Partnership Leads to Learning Opportunity for Feds in Florida

Increasing water demand, coupled with drought conditions from the past few years, has made water conservation a critical issue in Florida. The FEMP program in DOE's Atlanta Regional Office, the General Services Administration (GSA), and the Florida State Energy Office sponsored a state-specific workshop on water conservation for Federal facilities in Florida.

Numerous local Federal sites and water management district personnel helped cosponsor the workshop. The workshop was designed to help Federal agencies become part of the solution to the growing concern about water supplies in Florida.

Conducted August 29-30, 2002 in Orlando, Florida, the workshop's primary objective was to educate facility managers about how to conserve water and save money at Federal facilities in Florida. An important topic concerned assessing and improving water efficiency to reduce water use at Federal facilities, and thereby meet the requirements of Executive Order 13123. The workshop included both general water conservation information and specifics directly applicable to the particular water needs and requirements of Federal sites in Florida.

Beth Shearer, Director of FEMP, opened the workshop by providing a brief overview of FEMP's water conservation program and the significance of the workshop. Mark Ewing, Director of GSA's Center of Energy Expertise, gave an overview of water use by Federal facilities and outlined the components of GSA's Water Management Guide. He underscored the importance of water

conservation by stating that, "Using less water saves the electricity needed to heat, cool, treat, or move water, thereby cutting energy use and reducing harmful emissions from the burning of fossil fuels." The local workshop host, Ed Cobham, Program Manager for Federal Projects in the Florida Energy Office, also made a presentation.

Workshop speakers represented public and private sectors as well as academia. Mike Clawson, of Tyndall Air Force Base, gave an overview of the water conservation requirements of Executive Order 13123. Katherine Pordeli and Elizabeth Thomas, from the State of Florida's St. Johns River Water Management District, gave presentations on water supply management and site selection, landscaping, and irrigation. Melissa Roe represented the Southwest Florida Water Management District. She discussed resources that are helpful to develop a successful water conservation project. Tom Swihart, of the Florida Department of Environmental Protection, gave a presentation on the Florida Water Conservation Initiative. Tom Gustafson and David Hanna, both with the Florida Rural Water Association, spoke on the topic of leak detection and solutions to water management problems. Representatives from the City of Cocoa shared excellent case studies on two of their successful water conservation projects.

Dr. Mike West of Advantek Consulting, Inc. and Stan Stokes of Environmental Consulting and Technology, Inc. represented the private sector. West discussed the impact of cooling towers on a facility's water management plan, and how to reduce cooling tower water

use to best take advantage of recycling and reuse opportunities. Stokes' topic, "Where to Spend Your Time and Money" for water conservation projects, addressed the tools necessary to implement a water management plan, as well as issues to be aware of when using outside consultants to assist in water management planning. Lonnie Burke, a master plumber and a professor at the Albuquerque Technical Vocational Institute, discussed the importance of a well-educated plumbing maintenance staff to a successful water conservation program.

On Wednesday, August 28, some of the workshop attendees participated in a pre-workshop behind-the-scenes walking tour of underground operations at Disney's Magic Kingdom in Orlando. Glen Connally, Manager of Park Support Engineering Services, led the attendees through Disney's Magic Kingdom underground tunnels, providing them with a view of the inner workings of the "world" beneath the Kingdom.

For more information or details on this workshop, please contact Traci Leath of DOE's Atlanta Regional Office at 404-562-0570 or traci.leath@ee.doe.gov. Presentations from the workshop will be available on DOE Atlanta Regional Office's web site at www.eren.doe.gov/aro/femp.html.

For more information on FEMP's water conservation program see the FEMP web site at www.eren.doe.gov/femp/techassist/waterconserve.html. FEMP provides technical assistance for water conservation through DOE's National Renewable Energy Laboratory and DOE's Pacific Northwest National Laboratory. For additional information on FEMP's Water Conservation Program, please contact Ab Ream of FEMP at 202-586-7230 or ab.ream@ee.doe.gov.

GSA's Richard Russell Federal Building Initiates Water Conservation Measures

The General Services Administration (GSA), DOE's Atlanta Regional Office, and FEMP have teamed to improve the restrooms in the Richard B. Russell Federal Building by replacing inefficient restroom fixtures with water conserving fixtures. Some of the new fixtures installed include 1.6 gallons-per-flush (gpf) toilets, 1.0 gpf urinals, 1.0 quart-per-handle-activation handwash faucets, and low consumption flushometer valves.

The new fixtures were installed in the second floor restrooms of the Russell Building during August 2002, and is scheduled to be completed during September 2002. GSA and DOE will then conduct a user survey to gather responses on product performance. The survey will examine maintenance issues and user preferences. Based on the user survey responses, GSA plans to upgrade restrooms on all 23 floors of the Russell Building.

The United States uses about 4.8 billion gallons of water every day to flush waste, and tremendous amounts of water and energy are wasted using inefficient faucets. Toilets and urinals account for nearly one third of a buildings' water consumption—the potential for savings from water conserving fixtures is significant. Unless a building is relatively new or has been refurbished recently, chances are that excess water is going down the drains of older-model toilets and urinals. Current Federal law requires that residential toilets manufactured after January 1, 1994 must use no more than 1.6 gpf. Commercial toilets manufactured after January 1, 1997 must use no more than 1.6 gpf and urinals must use no more than 1 gpf. Federal guidelines also mandate that all lavatory and kitchen faucets and aerators manufactured after January 1, 1994, must use no more than 2.2 gallons-per-minute. If a building still uses older faucets, there is a significant opportunity to save both water and energy costs.

In 1992, an overwhelming majority of the U.S. Congress supported the adoption of national standards for water conserving plumbing fixtures. As part of the Energy Policy Act (EPAct), the standards mandate specific flush volumes and flow rates for plumbing products.

EPAct was adopted in part to promote the conservation and the efficient use of energy and water. The Act requires

minimum water efficiency standards for plumbing equipment including toilets, showerheads, faucets, and urinals. These high performance plumbing fixtures substantially reduce water consumption, wastewater production, environmental damage, and water utility costs.

National water efficiency plumbing standards are necessary because:

- **Fresh water is a finite resource and a valuable commodity;**
- **The capacity of streams, lakes, and estuaries throughout the country to assimilate wastewater is being severely burdened;**
- **It is expensive to develop and treat new water sources and build the additional water and wastewater treatment facilities needed to process increased wastewater loads; and**
- **Water conservation through the use of efficient plumbing products helps keep water rates affordable for consumers.**

Curbing nationwide water consumption can yield significant environmental benefits and energy and cost savings. Even in communities with an adequate supply of water, the cost of collecting, transporting, and treating water and wastewater can place a heavy burden on utilities and consumers. A continuing Federal role is appropriate because only the Federal government can control the importation of devices from outside the United States and only the Federal government has purview over interstate shipment of plumbing hardware.

Water is one of our most vital and precious resources. Water efficiency measures can conserve important water resources and reduce operating costs.

For more information, please contact Yolanda Frinks of DOE's Atlanta Regional Office at 404-562-0628 or yolanda.frinks@ee.doe.gov, or Stephanie Tanner of DOE's National Renewable Energy Laboratory at 202-646-5218 or stephanie_tanner@nrel.gov.

Mark Your Calendar for FEMP's Utility Project Workshops

See how your facility can benefit from energy and water efficiency improvement services that may be offered by utilities that serve your facility. Make plans to attend FEMP's Utility Energy Services Contracting Project Workshops and learn a step-by-step approach to implementing efficiency and renewable projects through Federal agency and utility partnerships.

The workshops provide attendees with an overview of the contracting options and services available from local utility companies that offer engineering, financing, and installation of cost effective energy and water savings projects. Participants walk through the typical project process, from the audit phase to commissioning equipment. Upon completing this workshop, participants will have the contracting and

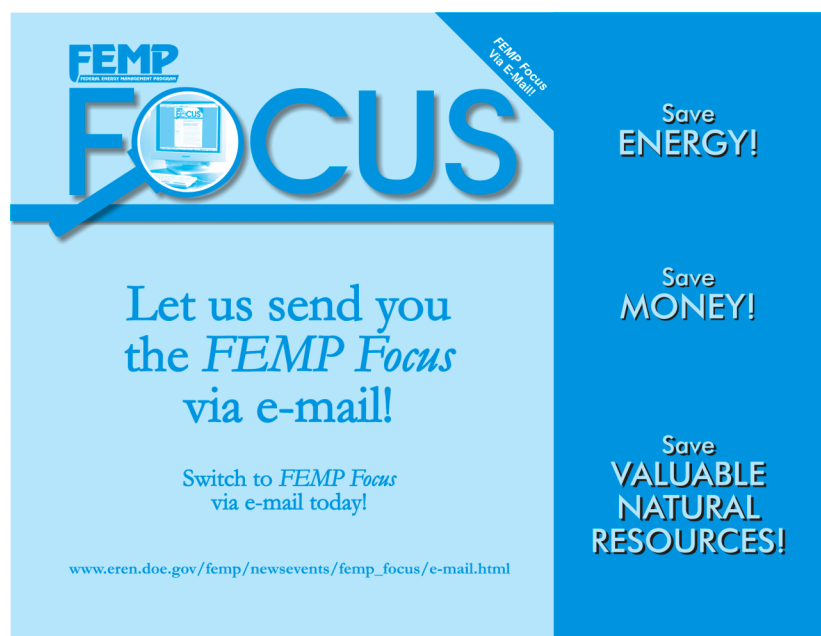
technical knowledge to begin a project at their facility. This innovative alternative financing opportunity provides a mechanism to help solve facility problems and meet program objectives and goals.

Who should attend? Federal project implementation teams including facility and energy managers, engineering and legal staff, and procurement and contracting officials are strongly encouraged to attend. Priority will be given to Federal personnel. However, state and local government customers are welcome! Upcoming workshops are scheduled for:

- Tampa, Florida—November 18, 2002 in conjunction with the Federal Utility Partnership Working Group meeting;
- Brooklyn, New York—May 28-29, 2003; and
- Chicago, Illinois—September 16-17, 2003.

Take advantage of this opportunity to talk to the experts! Attendees are encouraged to bring information about their specific energy and water efficiency and renewable energy projects for workshop exercises and to get input from the workshop instructors.

The registration fee is waived for these workshops. For more information about the Tampa workshop, or to register, please call Judy Powers of NREL at 303-384-7407. For more information about the 2003 workshops, please call the FEMP Workshop Hotline at 703-243-8343.



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ASHRAE Winter Meeting and AHR Expo

January 25-29, 2003
Chicago, IL
www.ashrae.org
203-221-9232

Energy Outlook Conference

February 9-12, 2003
Washington, DC
703-299-8800
www.naseo.org/events/default.htm

Greenprints 2003

February 12-15, 2003
Atlanta, GA
[www.southface.org/home/g2k3/
g2k3index.html](http://www.southface.org/home/g2k3/g2k3index.html)
404-872-3549, ext. 114

Building Energy 2003 Conference and Trade Show

March 12-15, 2003
Boston, MA
www.nesea.org/buildings/be/
413-774-6051

National Facilities Management and Technology Conference/Exhibition

March 18-20, 2003
Baltimore, MD
www.nfmt.com
630-271-8210

Motor Systems Management and Decision Support Tools

December 3, 2002
Fairfax, VA
703-573-4500
info@wetrainindustry.com

Heat Pump Water Heater Workshop

December 4-5, 2002
Portland, OR
kathi.ruiz@pnl.gov
503-417-7551

Keys to Energy Management

December 5-6, 2002
Bethesda, MD
www.aeecenter.org/seminars
770-925-9633

Steam Efficiency Seminar

January 14, 2003
Fairfax, VA
703-573-4500
info@wetrainindustry.com

Design Strategies for Low-Energy, Sustainable, Secure Buildings

January 15-16, 2003
Washington, DC
[www.eren.doe.gov/femp/
newevents/calendar.shtml](http://www.eren.doe.gov/femp/newevents/calendar.shtml)
202-628-7400, ext. 201

High-Performance Buildings

January 23, 2003
Portland, ME
[www.nesea.org/buildings/
workshops/](http://www.nesea.org/buildings/workshops/)
413-774-6051

Implementing Renewable Energy Projects

January 28-29, 2003
Miami, FL
patrina@solarstreetfurniture.com
303-384-7553

Life-Cycle Costing (Combined: Basic and Project-Oriented)

February 4-5, 2003
Honolulu, HI
www.pnl.gov/femp/
509-372-4520

Fundamentals of Indoor Air Quality

February 5-7, 2003
San Francisco, CA
770-447-5083, ext. 223
www.aeecenter.org/seminars/

Life-Cycle Costing (Combined: Basic and Project-Oriented)

February 6-7, 2003
Honolulu, HI
www.pnl.gov/femp/
509-372-4520

Super Energy Savings Performance Contracting Workshop

February 25-26, 2003
San Francisco, CA
[www.eren.doe.gov/femp/
newsevents/calendar.shtml](http://www.eren.doe.gov/femp/newsevents/calendar.shtml)
703-243-8343

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If you are making projects happen at your Federal facility, FEMP would like to hear from you. Please submit project descriptions to Annie Haskins at the address listed below. You will be contacted for additional information if your project is selected to be featured in a future edition of the *FEMP Focus*.

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